UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
VIDA, MELANIE M

ART UNIT	PAPER NUMBER
2626	

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Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *12 March 2004*.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *2-10 and 13-27* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☒ Claim(s) *2-10, 13-16* is/are allowed.

6) ☒ Claim(s) *17-27* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All b) ☐ Some * c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1.   This action is responsive to an amendment filed 3/12/04. Claims 2-10, and 13-27 are

pending. Claims 1 and 11-12 are cancelled. Applicants have amended claims 2, 7, 9, 10, 13, 16,

17, 25.

Response to Arguments

2.   Applicant's arguments with respect to claim 19, are persuasive, but are moot in view of

new ground(s) of rejection. In view of the Applicant's remarks, it is agreed that Balasubramanian

does not disclose that an image pyramid is constructed from an input image, or that each

resolution layer is processed, which includes completing a gradient iteration, as set forth in claim

19, and in the Attorney's remarks on pages 19-20. Thus a new grounds of rejection of Van de

Velde et al. is applied below, US-PAT-NO: 6,731,790 B1, (hereinafter, Van de Velde) in claim

19. A new grounds of rejection of Balasubramanian et al. US-PAT-NO: 6,646,762 and further in

view of Van de Velde, US-PAT-NO: 6,731,790 B1.

Claim Rejections - 35 USC § 112

3.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the
subject matter which the applicant regards as his invention.

4.   **Claims 17, 18, 19-27** are rejected under 35 U.S.C. 112, second paragraph, as being

indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

Regarding, **claim 17,** it is unclear to the Examiner from the claim language, what the

applicant is specifically calling an "image difference problem". The Examiner understands that

an "image difference problem" can include a wide variety of image differences caused by

input/output image color gamut mapping, comparisons of input images with decompressed

output images, to name a few. Image differences can also refer to comparisons during various

stages of image processing, such as post image processing, (i.e. image enhancement), or image

pre-processing (such as color transformations). It appears from the claim language and from the

specification that the Applicants are referring to image differences caused by a color gamut

mapping from a first colorimetric value to a second colorimetric value. Clarifying language is

needed in this claim.

Furthermore, it is unclear to the Examiner from the claim language, what the applicant

defines as a "space varying algorithm". A "space varying algorithm" appears to be an adaptive

algorithm that adapts a type of image processing to specific local features in an image. This can

broadly mean adaptive halftoning, or adaptive compression, to name a few. It appears from the

claim language, and from the specification that the Applicants refer to a "space varying

algorithm" as a gradient descent algorithm. Further, clarifying language is necessary in the

claims.

Regarding, **claim 18,** it is unclear to the Examiner whether "a normalized steepest descent value" refers to the parameter "L_j" or "μ_{NSD}" in line 7;

Regarding, **claims 19-20,** there appears to be a lack of antecedent basis in the execution of the steps for processing each resolution layer, as specifically recited in claim 19. It is noted by the Examiner, in claim 19, lines 7-10, the steps of processing each resolution layer includes, "calculating a gradient **G**;" "completing a gradient descent iteration; and", "projecting the completed gradient descent iteration onto constraints;" "computing an output image using the processed resolution layers", (lines 9-10). However, in **claim 20,** the gradient **G** is calculated as a function of the output image (**u**) and the input image ($\mathbf{u_o}$). Based on the claim language, and a thorough investigation of the specification it is unclear to the Examiner how the Applicants are "calculating a gradient **G**" in claim 19, as a function of the output image, as specified by the equation in claim 20, before "computing an output image", in the following step of claim 19. Clarifying language is needed in these claims.

Claim 23 is unclear to the Examiner because the specification and the claim do not clearly define what the "initial conductive L_o" means, (line 5-6).

Claim 18 recites the following limitations:

"**u**" in line 5;

"$\mathbf{u_o}$" in line 5;

α_K in line 5;

"K_{LAP}" in line 6;

"k" in line 6;

"L$_j$" in line 7;

"j" in line 7;

"μ_{NSD}" in line 7;

There is insufficient antecedent basis for this limitation in the claim.

Claim 21 recites the following limitations:

"L$_j$" in line 3;

There is insufficient antecedent basis for this limitation in the claim.

Claim 25 recites the following limitations:

"the following variational problem" in lines 2-3;

There is insufficient antecedent basis for this limitation in the claim.

Claims 22, 24, and 26-27 are rejected under 35 USC 112 second paragraph for depending on claim 19.

Claim Rejections - 35 USC § 102

5.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6.   **Claims 17 and 19** are rejected under 35 U.S.C. 102(e) as being anticipated by Van de

Velde et al. US-PAT-NO: 6,731,790 B1, (hereinafter, Van de Velde).

Regarding, **claim 17,** Van de Velde inherently teaches, "a computer-readable memory" as

evidenced by an algorithm for image reconstruction, (col. 9, lines 1-3). Van de Velde, as shown

in figure 1, teaches of mapping a color space in R, G, B, to L, u, v, and L, u, v, to L', u', v'

colour space, and finally, a color gamut mapping from L', u', v' to R', G', B' colour space,

which reads on "for color gamut mapping, comprising an instruction set for executing color

gamut mapping steps, the steps, comprising:" (col. 3, lines 29-65 through col. 4, line 5). Van de

Velde teaches a method for enhancing the resolution of colour images by converting the R, G, B

colour space to L, u, v perceptual colour space, and re-scaling L, u, v, to obtain a modified L', u',

v', colour space, and converting perceptual colour space back to modified RGB color space,

which reads on "converting first colorimetric values of an original image to second colorimetric

values", (col. 3, lines 29-65 through col. 4, line 5). Van de Velde inherently teaches, "wherein

output values are constrained within a gamut of the output device" as evidenced in applying a

colour transform to obtain R'G'B' colour space, a representation that is compatible with additive

colour reproduction systems, (col. 3, lines 39-34; col. 8, lines col. 9, lines 1-2; lines 9-11). The

method, as shown in figure 2, decomposes an original colour image into a corresponding multi-

scale gradient representation by a discrete gradient in a horizontal and vertical direction, which

reads on "using a space varying algorithm", (col. 5, lines 10-15). Additionally, it is an objective

to modify perceptual colour differences represented by a difference in the Luv colour space

distances between colors in Euclidian space, which reads on "that solves an image difference

problem", (col. 3, lines 49-52; col. 5, lines 6-10; col. 8, lines 13-20). The norm of the color

gradient at a resolution level is changed without affecting the direction such that unwanted

colour shifts is avoided in a reconstructed colour enhanced image, which reads on "optimizing a

solution to the image difference problem wherein the instruction set further comprises steps for:"

(col. 8, lines 20-27). The L, u, v colour planes are decomposed into a multi-resolution

representation at difference resolution layers, which reads on "decimating the input image to

create one or more resolution layers", (col. 4, lines 8-12). Additionally, other kinds of multi-

resolution representations such as a Laplacian pyramid representation, which reads on "wherein

the one or more resolution layers comprise an image pyramid", (col. 4, lines 34-37). An image is

reconstructed from its multi-scale gradient representation by recursively applying equations 6-9

for j=K-1 to 0, (see figure 3), which reads on "solving the image difference problem for each of

the one or more resolution layers", (col. 7, lines 30-33).

Regarding, **claim 19,** Van de Velde, as shown in figure 1, teaches a sequence of image

steps for decomposing, modifying, and reconstructing an image, which reads on "a method of

image enhancement using gamut mapping, comprising: receiving an input image", (col. 2, lines

65-67; col. 3, lines 62-67). Furthermore, Van de Velde states that from the input R,G, B image

converted to L, u, v, image, which reads on "from the input image," constructing multi-

resolution representations such as a pyramid representations, which reads on "constructing an

image pyramid", (col. 4, lines 34-37). As shown in figure 2, the details of the decomposition of a

colour component image into a corresponding multi-scale gradient representation, which reads

on "processing each resolution layer, wherein the processing includes completing a gradient

iteration, by:" (col. 5, lines 10-15). The discrete gradient, G_jI of each approximation image is

then calculated by applying the formula in equation 2, which reads on "calculating a gradient

G;", (col. 5, lines 60-67). The projection of the completed gradient descent iteration is subject to the constraint that a representation can only be useful for the problem of image enhancement if the decomposition process is reversible, which reads on "projecting the completed gradient descent iteration onto constraints;" (col. 6, lines 12-18). Equation 6 expresses that the sub-sampled version of the approximation image can be recovered from the coarser approximation image and the gradient of the approximation image, which reads on "projecting the completed gradient descent iteration onto constraints;" (col. 6, lines 62-65). As shown in figure 3, an image is reconstructed from its multi-scale gradient representation by recursively applying equations (6) through (9), which reads on "and computing an output image using the processed resolution layers", (col. 7, lines 30-34).

Allowable Subject Matter

7.   **Claims 2-10, 13-16, 18, and 20-27** are allowed. The claims are allowable because the prior art of record specifically, Balasubramanian et al, US-PAT-NO: 6,646,762 and Van de Velde et al. US-PAT-NO: 6,731,790 B1 fail to teach or suggest the collective features of the invention, such as the image difference problem, represented by the equation, E(u).

      Claims 18 and 20-27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

      Claims 18 and 20-27 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

8.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Melanie M Vida whose telephone number is (703) 306-4220.

The examiner can normally be reached on 8:30 am 5:30 pm.

     If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Kimberly A Williams can be reached on (703) 305-4863. The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

     Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

                                        Melanie M Vida
                                        Examiner
                                        Art Unit 2626

MMV

May 13, 2004

KIMBERLY WILLIAMS
SUPERVISORY PATENT EXAMINER